Lessons from CCUS Projects in Illinois

Opportunities, Challenges, and Lessons Learned of CCUS

Louisiana Industrial Decarbonization Special Session
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Illinois' Experience on the Road to CCS Commercialization

CarbonSAFE Illinois

ILLINOIS Industrial Carbon Capture & Storage

FutureGen 1

FutureGen 2

IBDP:
1 Mt stored

IL-ICCS:
3 - 5.5 MT
Industry Site - active

CarbonSAFE Illinois:
Phase 1

CarbonSAFE Illinois:
Phase 2
>50 MT Feasibility

CarbonSAFE Phase 3:
Class VI Permitting

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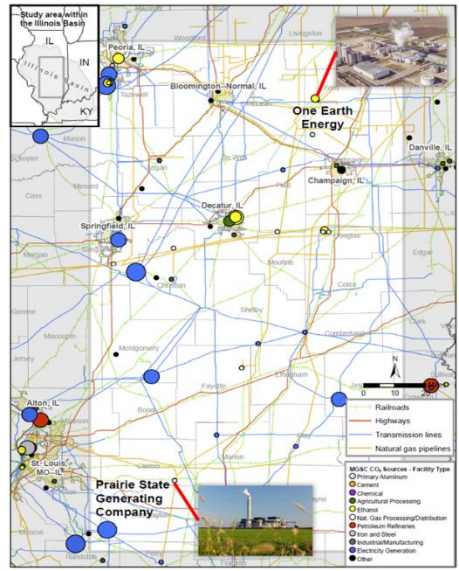

MGSC

2000's

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2020's

MRCI Midwest Regional Carbon Initiative

Technical Feasibility

IBDP

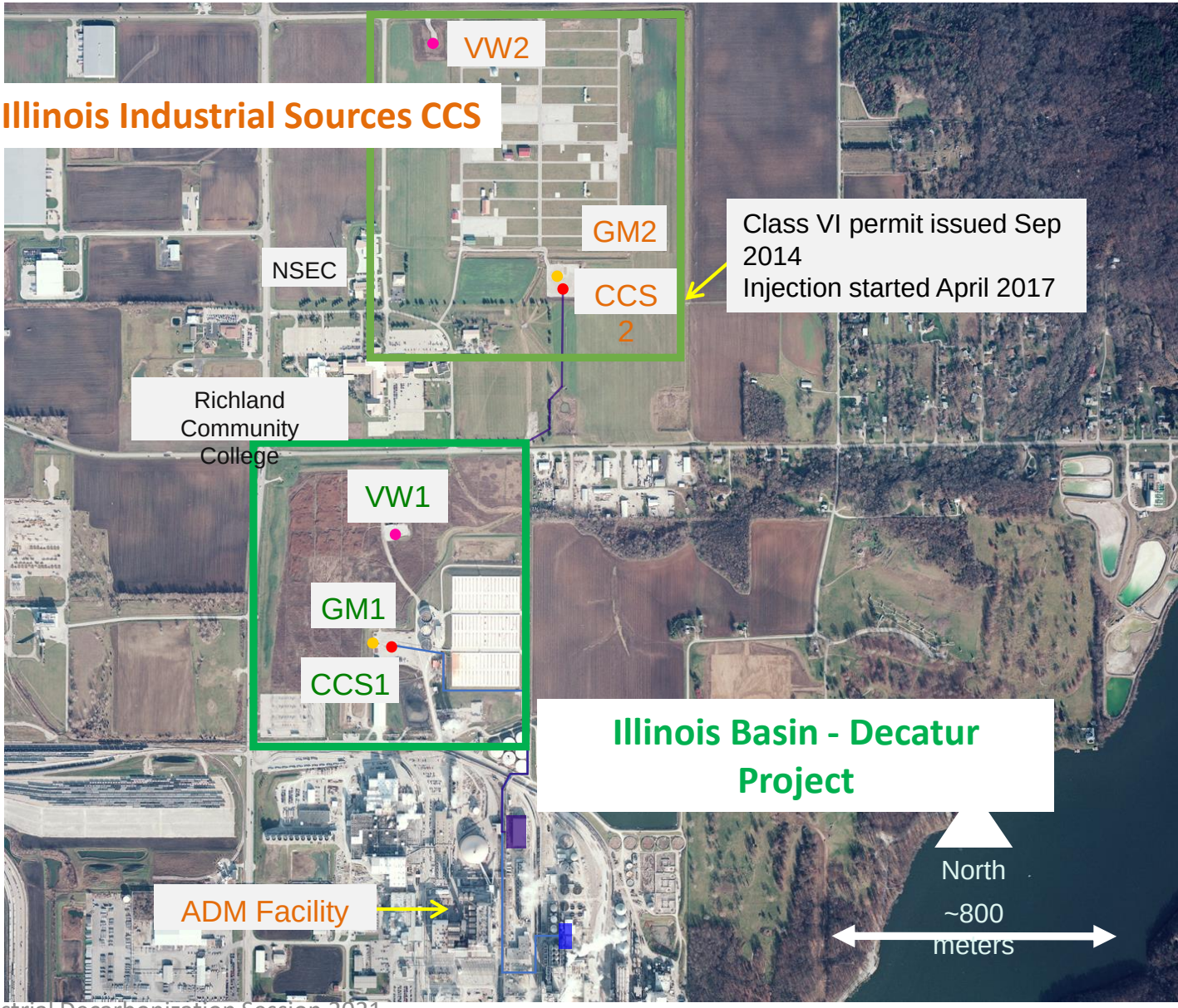
- Demonstrated capture, transport, secure storage, and monitoring of 1 million tonnes of CO_2 from biofuel production in an onshore saline reservoir ~1.5 miles deep

IL-ICCS

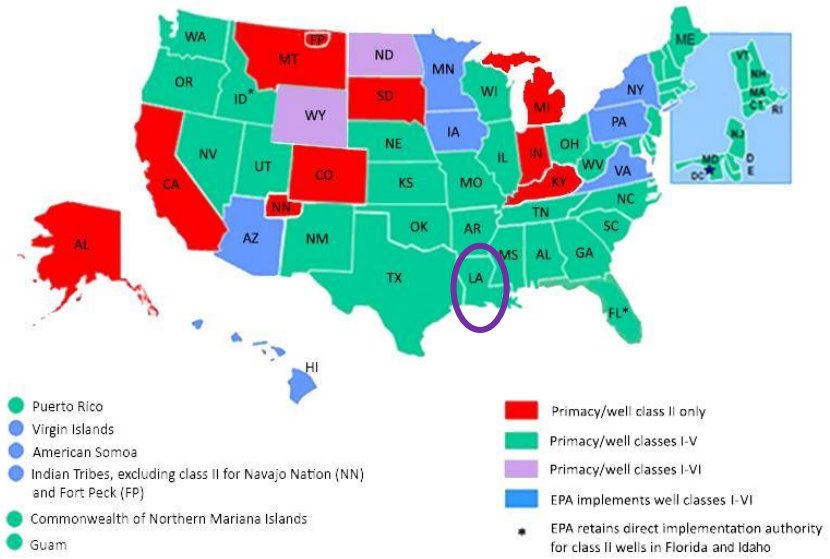
- Ongoing commercial injection operations under Class VI

Technology transfer from oil & gas industry - decades of experience

Transportation Infrastructure will be required – e.g. pipelines



Class VI Permitting



All Six Class VI permits have been issued in Illinois, only two are in use:

- Well CCS1 – Illinois Basin – Decatur Project
  - Post-injection site care (PISC) completed (~6 years)
- Well CCS2 – Archer Daniels Midland (IL-Industrial Sources CCS)
  - Full operations permit, 10-year PISC
- FutureGen 2.0 - 4 permits issued, withdrawn when ARRA funding expired

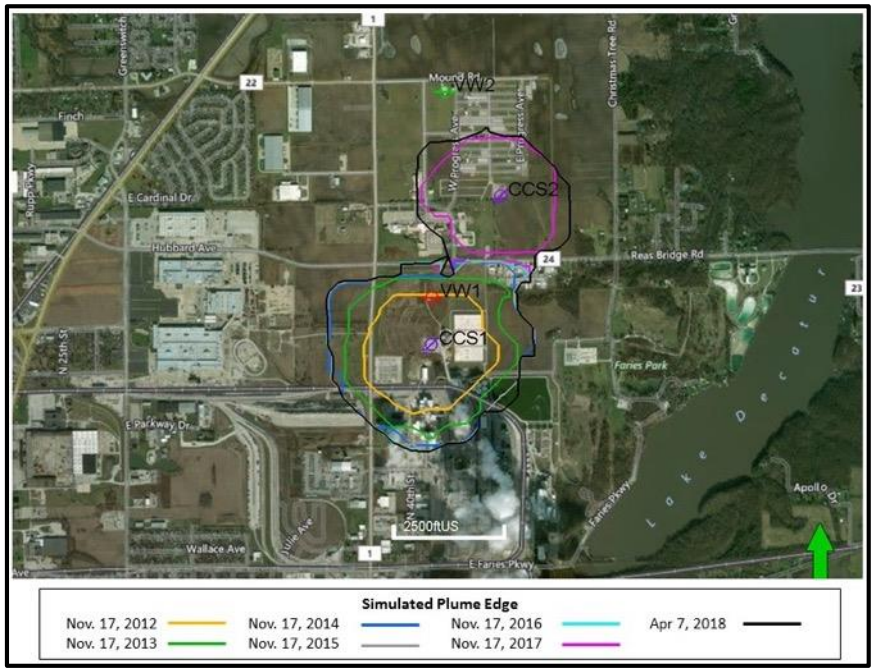
- Permitting has been rate-limiting step for both Illinois projects
  - 3 years to issue permit, 3 years to receive permission to inject
- Key issue: Uncertainty lies between issuance of final permit and authorization to inject – up to 3 years

- Accelerate timing of permitting
  - Impacts ability to realize 45Q tax credit
  - Project Risk

Risks

should be addressed within Class VI permit submission

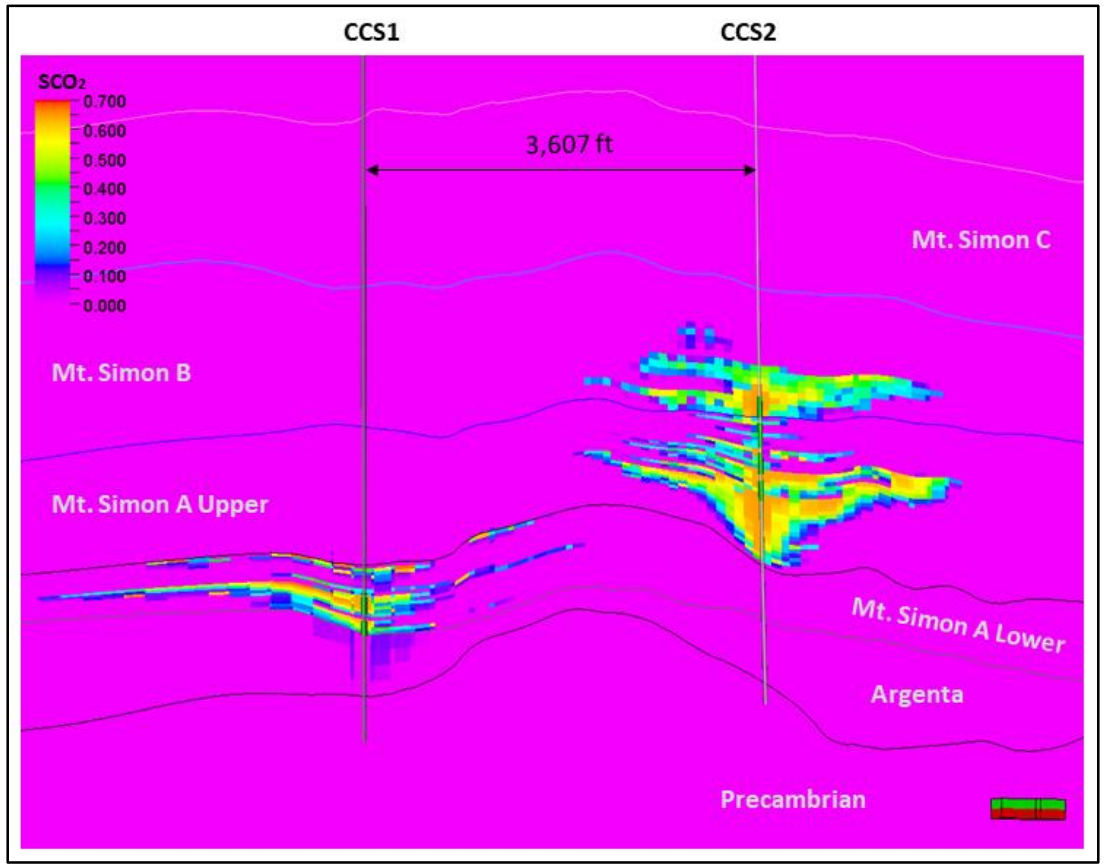
- Leakage
  - Legacy well bores
  - Unidentified geologic features
  - Area of Review
- Induced seismicity
  - Passive seismic monitoring
- Migration beyond project boundaries
  - Monitoring Plan



Ability to Monitor & Model

- There are a wide range of technologies than can be used to monitor and model CO_2 in the subsurface
  - Instrumented monitoring wells
  - Surface seismic
  - Downhole sensors
- This helps identify conformance or non-conformance
  - Mitigation of risks
- Used for quantification and verification of storage

Illinois CCS Sites



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Stakeholder Engagement

Project Stakeholder Engagement

1. Conduct projects to demonstrate safety and address gaps in knowledge or experience.
2. Engage local stakeholders, regulators, and project developers.
3. Provide proof of concept.

Policy Stakeholder Engagement

1. Create effective legal and regulatory mechanisms and policy to support widespread deployment of CCUS.
2. Engage lawmakers, coalitions, policymakers, and industry.
3. Set policy to incentivize CCUS actions and development.
4. Identify common ground and potential opposition points.

Public Stakeholder Engagement

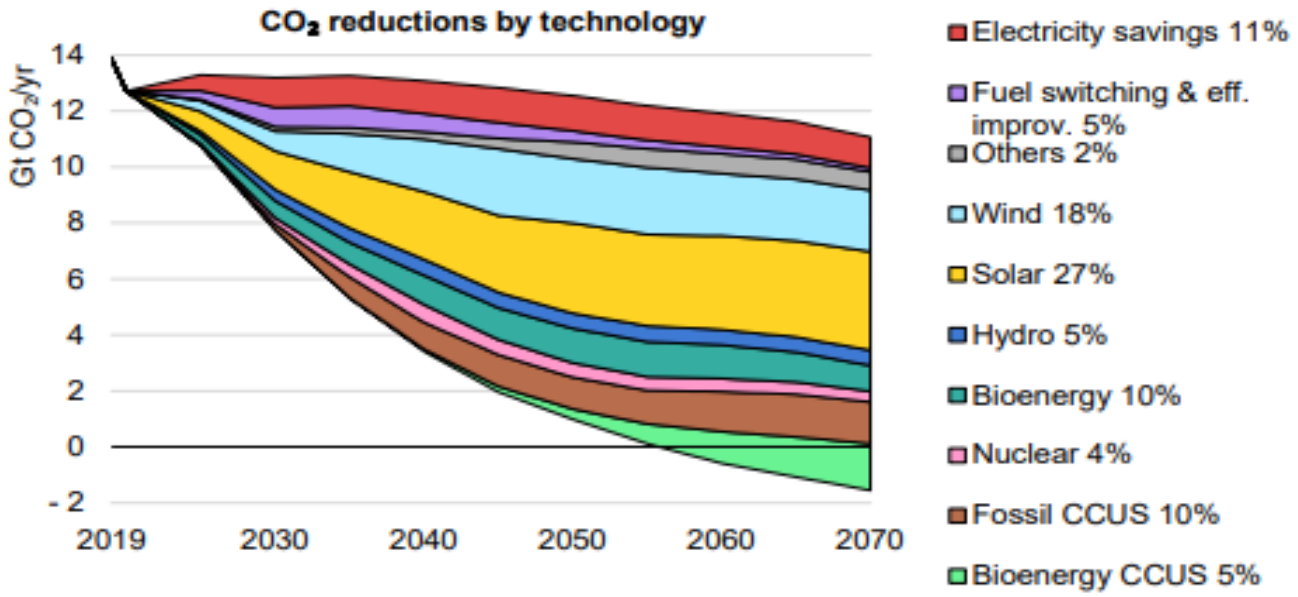
1. Create public engagement programs and opportunities.
2. Engage the public to build trust in carbon management.
3. Increase understanding and support.
4. Connect with the "big picture"— economy, climate, creation of jobs.

Greenberg, 2019. Stakeholder spheres of engagement.

Incentives

- Policy drivers are necessary for commercialization
- Tax credits such as 45Q
- Public-private initiatives
- Societal demand for action

CCUS provides a technology to decarbonize a wide range of industries including heavy industries with no other option such as cement and steel – and unlocking the potential of hydrogen production



IEA Energy Technology Perspectives 2020

Recommendations

- Stakeholder engagement process needs to start early and be more robust than what is required in permitting process

- Cultivate knowledgeable stakeholders
  - Provide factual information - Inform about potential risks and benefits
  - Address perceived risks

- Support primacy regulatory efforts
  - ensure capacity, capability, and protocols to properly administer, monitor, and manage these activities.